DOCUMENT RESUME

ED 117 090 95 SP 009 790

AUTHOR Hunt, David E.
TITLE Teachers' Adaptation to Students: Implicit and Explicit Matching. Research and Development Memorandum No. 139.
INSTITUTION Stanford Univ., Calif. Stanford Center for Research and Development in Teaching.
SPONS AGENCY National Inst. of Education (DHEW), Washington, D.C.
PUB DATE Nov 75
CONTRACT NE-C-00-3-0061
NOTE 50p.

EDRS PRICE MF-$0.76 HC-$1.95 Plus Postage
DESCPIPTORS *Adjustment (to Environment); *Student Behavior; *Student Teacher Relationship; *Teacher Behavior; Teacher Influence; Teacher Response; *Teaching Styles

ABSTRACT

This paper examines the process by which teachers adapt their teaching behavior to their students, including (1) how adaptation is manifested spontaneously through implicit matching of students and teaching styles, (2) how implicit matching can be analyzed, (3) how models for matching teachers' approaches to different students can be described, and (4) how the models can be incorporated into daily teaching behavior. It summarizes work done to date on the effects of "student pull" (i.e., student influence on teacher behavior) and on the means of training teachers both to be sensitive to the differences among students and to use information about those differences as the basis for modulating their behavior. The process of matching is analyzed in a six-step sequence using a Behavior-Person-Environment system. Examples of implicit matching are given, and one model for explicitly matching teaching behavior to students' conceptual levels is described. It is stated that the long-term aim of applying explicit matching ideas is to facilitate teachers' implicit matching in their spontaneous adaptation to the needs of their students. (Author)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED117090

STANFORD CENTER
FOR RESEARCH AND DEVELOPMENT
IN TEACHING

Research and Development Memorandum No. 139

TEACHERS' ADAPTATION TO STUDENTS: IMPLICIT AND EXPLICIT MATCHING

David E. Hunt

School of Education
Stanford University
Stanford, California

November 1975

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Published by the Stanford Center for Research and Development in Teaching, supported in part as a research and development center by funds from the National Institute of Education, U. S. Department of Health, Education, and Welfare. The opinions expressed in this publication do not necessarily reflect the position, policy, or endorsement of the National Institute of Education. (Contract No. NE-C-00-3-0061.)

SP009 190

Introductory Statement

The Center's mission is to improve teaching in American schools. Its work is carried out through three research and development programs--Teaching Effectiveness, The Environment for Teaching, and Teaching and Linguistic Pluralism--and a technical assistance program, the Stanford Urban/Rural Leadership Training Institute. A program of Exploratory and Related Studies includes smaller studies not included in the major programs. The ERIC Clearinghouse on Information Resources is also a part of the Center.

This report was prepared at the request of the Program on Teaching Effectiveness as part of its work in the organizational domain of teacher behavior.

Contents

Abstract iv

Introduction 1

Student Effects on Teacher Behavior 2

Implicit Matching: Adaptability in Interpersonal Communication 7

Making the Implicit Explicit: Analysis of Adaptation 11

- Step 1: Specify the Goal (B) 12
- Step 2: Obtain Information about the Student (P) 14
- Step 3: Classify the Students (P) 16
- Step 4: Translate Characteristic into Approach (P to E) . . 16
- Step 5: Provide an Appropriate Environment (E) 17
- Step 6: Repeat the Cycle 18
- Responsibility for Each Step 18

A Conceptual Level Matching Model: An Explicit Example 19

- Description of the Model 20
  - Developmental CL Model 20
  - Contemporaneous CL Model 22
- Step-by-Step Application of the CL Matching Model 24
  - Step 1: Specify B 24
  - Steps 2 and 3: Classify P 24
  - Step 4: Translate P into E 30
  - Step 5: Provide the Appropriate E 32
  - Step 6: Repeat the Cycle 36

Assessment and Training of Teachers' Adaptation Skills 37

- Skill in Classifying Students 37
- Skill in Translating Knowledge into Action 39
- Two Examples of Training in Adaptation Skills 39

Summary 41

References 42

Abstract

This paper examines the process by which teachers adapt their teaching behavior to their students: how adaptation is manifested spontaneously through implicit matching of students and teaching styles; how implicit matching can be analyzed; how models for matching teachers' approaches to different students can be described; and how the models can be incorporated into daily teaching behavior.

It summarizes work done to date on the effects of "student pull" (i.e., student influence on teacher behavior) and on the means of training teachers both to be sensitive to the differences among students and to use information about those differences as the basis for modulating their behavior.

The process of matching is analyzed in a six-step sequence using a Behavior-Person-Environment (B-P-E) system. Examples of implicit matching are given and one model for explicitly matching teacher behavior to students' conceptual levels is described. The long-term aim of applying explicit matching ideas is to facilitate teachers' implicit matching in their spontaneous adaptation to the needs of their students.

TEACHERS' ADAPTATION TO STUDENTS: IMPLICIT AND EXPLICIT MATCHING

David E. Hunt

Introduction

Some teachers change their approach to suit their students more readily than other teachers; some teachers adapt more effectively than other teachers; and some teachers adapt to students in relation to immediate circumstances, while others adapt in relation to long-term development. This paper is concerned with the process by which adaptive changes in teachers' behavior occur: how adaptation is manifested spontaneously through teachers' implicit matching of students and teaching styles; how implicit matching can be analyzed; how models for matching teachers' approaches to different students can be described; and how these models can eventually be incorporated into the implicit adaptation of teachers' day-to-day classroom behavior. The paper is intended to show how teachers can be sensitized to differences among students and can use those differences as the basis for selecting the most appropriate educational approach. A number of published and unpublished studies are reviewed.

Teachers' adaptation will be analyzed in terms of the Behavior-Person-Environment system or B-P-E (Hunt, 1971, Ch. 4; Hunt & Sullivan, 1974, Ch. 12). In this system, a teacher is viewed as providing an environment (E) for a student or group of students (P) in an attempt to produce a particular behavioral effect or change (B). Viewing the teaching-learning process in terms of E:P→B may seem cumbersome initially, but it provides a convenient shorthand as well as an operational basis for defining various skill components in teaching. In this view, teaching effectiveness is defined as:

David E. Hunt is at the Ontario Institute for Studies in Education, Toronto, Ontario, Canada.

> ... the capacity to present the same lesson in a variety of instructional forms (Environments), to select and use that form (E) most appropriate to produce a desired outcome (B) with a particular student or group of students (P), and to shift to a new form when necessary [Hunt, 1971, p. 52].

This definition gives a general basis for meeting student needs both immediate and long-term, and gives a specific basis for identifying the skills required for meeting student needs. In other words, adaptation in B-P-E terms refers to selecting the appropriate environment (instructional form) in relation to a particular person and specific behavior, as well as shifting from that environment to another at a later point when required.

Not only do environments influence persons, but persons influence environments, and this is especially true for the influence of students on a teacher's approach. How much a teacher's behavior varies in relation to differences in students, or is susceptible to "student pull," is a general indication of a teacher's degree of adaptation to the student. Teachers may be unaware of "student pull," reacting entirely on an intuitive basis. However, the results of P→E investigations are initially helpful because they illustrate the adaptation process in its implicit, intuitive, spontaneous form. Eventually, of course, an adequate account of the teaching-learning process will need to take account of the reciprocal relations (E⇄P) between teaching approach and student (cf. Gage, Runkel, & Chatterjee, 1963; Hunt, 1973). For now, it is a step toward formulating such an account to reverse the usual E→P direction of effects to consider that of P→E.

Student Effects on Teacher Behavior

To get a feeling for what is meant by "student pull," try a couple of examples. First, imagine that you are asked by a six-year-old for instructions on how to find the nearest mail box and then consider how your response might differ from the way you would respond to the same question asked by an adult. Second, consider how a teacher's behavior in a high school class differs from that of a teacher in a primary class.

These are extreme examples intended to illustrate the general nature of "student pull."

It is a curious tribute to the unidirectional (E→P) definition of educational research that, as recently as 1967, Turner (p. 6) could say:

> The empirical evidence to support the hypothesis that pupils are an influence in the behavior of the teacher is wholly circumstantial.

Given the number of educational research studies up to that time, this is indeed an astonishing statement. It is not the purpose of this paper to discuss reasons for this dearth of evidence in detail, but one or two comments are in order. Just as we tend to think of parental practices as exerting a one-way effect on the developing child, we also tend to view the teaching approach as exerting a similar unidirectional influence on the student. Fortunately, this imbalance has begun to be redressed in the investigation of parent-child interaction since the appearance of Bell's seminal paper on direction of effects, which called attention to the reciprocal nature of parent-child interaction. Bell (1968) pointed out, for example, that certain infant characteristics, such as hyperactivity, are likely to "pull" certain parental behaviors rather than the other way around, as is usually asserted. Bell's emphasis on direction of effects has encouraged more comprehensive investigations of socialization with regard to the differential reaction of parents according to the sex of their child, as well as other child characteristics. Unfortunately, the handful of studies investigating the effect of students on teachers has not redressed this imbalance in educational research. Another reason for the dearth of investigations on "student pull" effects is that the methodology for such studies has not been clearly understood. In contrast to the familiar design for investigating the effect of teaching characteristics (e.g., Rosenshine & Furst, 1971), the teaching behavior becomes the dependent variable. A "student pull" study presents students varying in a known characteristic as the independent variable, and the number of observations is the number of teachers who work with these students. However, there have been a few such studies in education and related areas, and they are summarized below.

Investigations closely related to "student pull" have been conducted by research workers whose primary concern was the communication process (or what Flavell has called "developmental sociolinguistics") rather than classroom teaching (e.g., Flavell et al., 1968; Flavell, 1974; Siegel & Harkins, 1963), but their findings are relevant. For example, Siegel and Harkins (1963) investigated the effect of a listener's (student's) relative verbal ability upon the verbal behavior of an adult (teacher) who attempted to communicate without knowledge of the listener's verbal ability. The "students" were two groups of mentally retarded youngsters, one relatively high and one relatively low in verbal ability. The "teachers" were 21 male college students who were each assigned one low ability youngster and one high ability younster. The teacher's task was to work with each of the youngsters separately to help him assemble a simple puzzle. Verbal interaction was recorded, transcribed, and analyzed. Results indicated that interactions with the low ability youngsters produced greater vocal output, shorter sentences, and more repetition on the part of the adult communicators than the interactions with the high ability youngsters.

Rathbone (1970) investigated the "student pull" effects of variation in Conceptual Level, an index of cognitive complexity of learning style (Hunt, 1971) that will be described in another section. Experienced teachers were assigned to either a group of four low Conceptual Level (CL) students or a group of four high CL students (matched on ability) for a microteaching lesson. Each teacher's verbal behavior was recorded, transcribed, and analyzed. Major "pull" effects were noted on an index of interdependence, which was calculated by dividing the number of teacher statements that helped students to theorize or to express themselves by the total number of information statements (Joyce & Harootunian, 1967). Even though unaware of the nature of the groups, the teachers working with high CL students made significantly more interdependent statements than the teachers with low CL students. Unlike the Siegel & Harkins study in which the "teachers" taught one student of each type, the teachers in the Rathbone study taught four students of only one type; however, since the teachers were selected to be equivalent in their own CL, the results indicated "student pull" effects.

Although age was used in the initial two common-sense examples because of its obvious effect, few empirical studies have been conducted on the pull of age. Recently, however, interaction analysis patterns of teacher trainees with students at different grade levels have been compared by Joyce, Weil, & Wald (1973). When the interaction patterns of teacher trainees in K-2 classes were compared with the interaction patterns of teacher trainees in Grades 3-6, the latter were significantly higher in middle-level information processing. When the patterns of their cooperating teachers were considered (Joyce, Weil, & Wald, 1973), the same effect was noted.

"Student pull" can also be investigated by systematically manipulating student characteristics. For example, Klein (1971) manipulated positive and negative student reaction in a carefully counterbalanced design by providing instructions to college students about how to react. Twenty-four college teachers, ostensibly giving a guest lecture and unaware of the experiment, experienced systematic variations in student response: 15 minutes of positive student reaction, 15 minutes of negative student reaction, and 30 minutes of natural, "control" reaction. Strong pull effects were observed: positive student reaction produced greater teacher clarification while negative student reaction produced more teacher criticism and giving of directions.

The results of these five studies are summarized in Table 1.

In addition to these studies, Turner (1967) reanalyzed the results of the well-known Flanders study (1962) and found a tendency for student pull effects to influence the occurrence of indirect teaching behavior. Although classes were fairly heterogeneous in ability, Turner found a relation between the proportion of bright students in a class and the occurrence of indirect teaching in that class.

The studies summarized are not intended to be inclusive or definitive. Other studies could be cited, and further variations even within these studies could be discussed. For example, Rathbone (1970) also found effects due to teacher CL: high CL teachers made more interdependent statements (cf. Hunt & Joyce, 1967), but both high and low CL teachers showed the same pattern of susceptibility to student CL pull. Joyce,

TABLE 1

Summary of "Student Pull" Effects in Five Studies

Student characteristic investigated	Teachers	Students	Effect on teaching behavior
Verbal ability Siegel & Harkins, 1963)	21 college students	Mentally retarded youngsters varying in ability	Low ability: more words, shorter sentences, and greater repetition
Conceptual Level (Rathbone, 1970)	20 experienced teachers	Grade 6 students varying in CL	High CL: more interdependent statements
Age or grade (Joyce, Weil & Wald, 1973)	28 teacher trainees	Elementary students in K-2 vs. 3-6	Older (3-6): higher level information statements
Age or grade (Joyce, Weil & Wald, 1973)	15 experienced teachers	Elementary students in K-2 vs. 3-6	Older (3-6): higher level information statements and less negotiation
Positive or negative behavior (Klein, 1971)	24 college teachers	Manipulated variation in positive and negative behavior	Positive: more teacher clarification. Negative: more criticism and giving directions

Weil, and Wald (1973) reported differences between teacher trainee interaction patterns of K-2 vs. Grades 3-6 when teacher trainees were practicing specific models of teaching; however, these results seemed less relevant to general discussion of student pull effects.

It is certainly true that the occurrence of student pull influence in a given instance is complex and depends, among other things, on the nature of a student characteristic, a characteristic of the teacher, the nature of the task, the duration of interaction, etc. Most important for present purposes is the fact that not all teachers are equally susceptible to student pull, a point pursued in the following section. Given all of these qualifications, one point remains: Why did the effects described in Table 1 occur? Their intuitive reasonableness is not sufficient explanation. These findings, however, verify the occurrence of implicit adaptation or implicit matching.

Implicit Matching: Adaptability in Interpersonal Communication

Although the studies in Table 1 illustrate the occurrence of adaptation to students, they do not specifically illuminate the adaptation process since, with the exception of the Klein study, the nature of student behavior which "pulled" teacher behavior was not controlled, and there was only indirect evidence of how much teachers were sensitized to student characteristics. In an effort to overcome these limitations and also obtain information on various components of effective teaching, several communication tasks were devised to investigate a training agent's adaptability in interpersonal communication (Hunt, 1970).

Since these tasks were employed with a wide variety of training agents--teacher trainees, Peace Corps volunteers, mothers, for example--the generic term trainee was used to describe each of them (i.e. each communicator). The task was essentially a one-to-one microteaching situation in which the trainee was given a short time (12 to 15 minutes) in which to communicate a particular idea or concept to a role-playing listener or student. The trainee was given information about the concept, about the specific objective (B), and about the person (P). In addition, the role player systematically introduced predetermined obstacles

indicating his misunderstanding of the concept the trainee was attempting to communicate. Therefore, interest centered entirely on the trainee's approach (E) and how he modulated his approach to the obstacles. Modulating was viewed as an operational indication of selecting the E most appropriate for this P and B, and shifting when necessary.

A prototype communication task to communicate the concept of the balance of power in the United States government was used. The trainee was first given materials describing the system of checks and balances; next, he was told that he was to meet a Venezuelan emigrant, "George Lopez," who wanted to learn about the idea of balance of power in order to pass a citizenship examination; and then before meeting George he was given a one-page description about him. Finally, he met with the role player for 12 to 15 minutes in which he could present the concept in any way he wished. The role player systematically introduced five obstacles as appropriate, e. g., "The judges are like priests...they tell us what's right and wrong," or "The president is in charge...he tells everybody what to do."

Variation in trainee approach was enormous. Some trainees were completely unresponsive to the role player, delivering an unremitting inflexible mini-lecture in Political Science. Other trainees spent at least half of the allotted time getting to know George and his frame of reference before proceeding with an inductively derived lesson--e.g., since George was a waiter, using the analogy of three plates to be balanced on a tray to represent the three branches of government.

To capture this variation, an Adaptability Index was developed. Part of the Adaptability Index was based on the trainee's specific reaction to each of the five obstacles as follows:

Rating	Behavioral referent
1	Completely insensitive
3	Aware of obstacle, but does not modulate
5	Aware of obstacle, and makes some attempt to modulate
7	Shifts and modulates presentation in flexible fashion
9	Modulates and explores for more information from learner's frame of reference

Some flavor of the response variation can be conveyed by the following extreme examples of reaction to two of the obstacles.

Obstacle: "The judges are like priests...they tell us what's right and wrong."

Low (scored 1)	High (scored 7)
"No, they're not like priests because they're appointed to the Supreme Court by the President which must be approved by the legislature."	"In a sense, that's true, but they have no religious power; it doesn't matter what religion they are, but they do tell us what's right and wrong according to the Constitution."

Obstacle: "This sounds like it takes a long time...wouldn't it be better to have a revolution?"

Low (scored 2)	High (scored 9)
"No, no, why did you say revolution? I noticed that your country has been plagued by revolutions. But you see, the Constitution of the United States with these three separate branches of power is the longest standing written constitution in the world."	"It might be simpler, but I don't know that the results would be as good. What do you think? In your country do you have revolutions? Was the country better off after the revolution?"

(Hunt, 1970, pp. 330-331)

For present purposes, the general nature of this adaptability scale is more important than the details of scoring. Note that the scale deals with two components: "reading" the student's misunderstanding and adjusting, or "flexing," the communication approach accordingly. The Adaptability Index was also based on a number of high inference ratings, e.g., seeking information, language level, etc. When these scale ratings were factor analyzed, the resulting factors supported these two components of adaptability (Hunt, Joyce, & Weinstein, 1965, p. 9). In two separate samples, the same two factors emerged, one that indicated the trainee's sensitivity to the role player (loading on seeking initial information) and a second that was apparently the adaptation of this acquired information (loading on adaptation, language level, etc.). These factors seemed to represent "reading" and "flexing," respectively.

Effective interpersonal communication, as indicated by the overall Adaptability Index, requires both skills. Several other tasks have been developed on the Balance-of-Power prototype, and the Adaptability Index has been shown to have considerable construct validity (Hunt, 1970), especially in relation to training both skills. In specific training it is important to distinguish the trainee's skill repertoire in terms at least as specific as his capacity to "read" and to "flex," since some trainees can "read" but are unable to translate the information into a modulation of their teaching approach.

Flavell and his associates (1968) have proposed a similar analytic framework to account for the process of effective interpersonal communication, which they regard as depending on two abilities:

> (1) the general ability and disposition to "take the role" of the other person in the cognitive sense ...and (2) the more specific ability to use this understanding of the other's role as a tool in communication with him [Flavell et al., 1968, p. 1].

Flavell's research, therefore, has investigated the development of "reading" and "flexing." In one of the first studies (Flavell et al., 1968), young children were asked to communicate with two persons, one normal and one blindfolded (in a design similar to the Siegel & Harkins study) to observe whether they would take account of the special requirements of the blindfolded person in their communication. For seven-year-old "teachers," there was little difference in their communicating, i.e., they were apparently not susceptible to the "student pull" of the blindfold.

Flavell and his colleagues have conducted several studies with children, and a recent study was directly aimed at investigating the communicator's sensitivity to the listener (Peterson, Danner, & Flavell, 1972). Four-year-old and seven-year-old communicators experienced three variations of communication failure, or "obstacles" in the earlier sense: (1) facial condition (listener looked puzzled), (2) implicit (listener said "I don't understand"), and (3) explicit (listener said "Can you tell me anything else about it?). The analysis focused on whether the communicator reformulated the message (a procedure which had

intentionally been simplified so that relative skill in "flexing" was not an issue) in response to each of the three conditions. All communicators flexed to the explicit condition; most of the seven-year-olds but few of the four-year-olds flexed to the implicit condition (the most interesting developmental result reported), and few of either age flexed to the facial condition. Although these results are not directly applicable to the training of teachers, they exemplify the process of sensitization to communication failure and illustrate how it might be investigated. In a recent paper on the development of inferences about others, Flavell (1974) has extended his analysis of the process. He specifies the following components of communication: (1) existence, or the communicator's knowledge that information exists; (2) need, or the person's awareness that the situation requires inferential activity; (3) inference, reading, or the "role taking" in the earlier definition; and (4) application, or flexing.

Returning to a consideration of student effects, susceptibility to "student pull" requires the operation of both components discussed in this section: the capacity to be sensitive to the student ("reading" the student) and modulating the approach ("flexing") in relation to the student's requirements. For example, in the Rathbone study, teachers gave their impressions of the students on a short post-experimental questionnaire, and when answering the question whether the students preferred to get information from themselves or from the teacher, teachers rated the high CL students as significantly more interested in obtaining information from themselves than from the teachers. Their sensitivity to these students was naturally translated into greater use of interdependent statements (Table 1). Teachers may not always be aware of or able to describe exactly how they "read" students, but for training purposes the process must be made as explicit as possible.

Making the Implicit Explicit: Analysis of Adaptation

The purpose of this section is to analyze the adaptation process into a series of steps. This analysis should be congruent with what has been said earlier about teachers' implicit matching, and should set the basis for applying specific matching models. Up to this point we have

described only the general characteristics of adaptation, intentionally ignoring many specific differences among experiments and experiences described. Obviously, the process of adaptation must be viewed in a context of (1) size of unit (one student, several students, one class, several classes); (2) time (or what Cronbach [1967] has called the scale of adaptation, from "microadaptation"--every few minutes--to "macrotreatments" over a much longer time); (3) objectives (contemporaneous or developmental, adapting goals to students, adapting approaches to students with fixed goals, etc.); and (4) responsibility--how much is the teacher's and how much is that of other decision makers? All of these factors are commented on as the analytic system is described. Rather than deal with all of the qualifications necessary by considering these and other factors, I have described a system to help teachers select the most appropriate educational approach for one or more of their students.

Step 1: Specify the Goal (B)

Adaptation of teaching approach to students must be viewed in the context of certain goals. As Scott (1966) has observed, psychologists and educators tend to accept such terms as adaptability and flexibility as generally desirable without specifying the conditions in which they operate. He described two patterns of response variation (teacher behavior, in present terms) that are not necessarily desirable: (1) "stimulus tracking," which refers to response variation that is completely determined by variation in stimuli (teacher behavior changes whenever students change) and (2) "spontaneous alternation," which refers to response variation that is unrelated to stimulus variation (teacher changes approach for no apparent reason). He stressed that the value of these changes can only be evaluated in relation to specified goals, whether short-term or long-term.

Speaking specifically of what he called the teacher's "impressionistic adaptation of instruction," Cronbach (1967) noted that teachers are likely to overdifferentiate among students, and presumably to overadapt instruction accordingly. He maintained that "modifying treatments too much produces a worse result than treating everyone alike" (p. 30). Whether one agrees with this statement or not, the points made by

Cronbach and Scott must be considered. Both critiques emphasize the necessity for an explication of objectives, and for an explicit conceptual model in which such objectives may be accomplished by specifically described adaptation.

In the communication task described in the preceding section, the stated objective was clear--in this case to communicate the concept of balance of power. The microadaptations to the obstacles, therefore, were desirable in relation to this specific objective. A trainee who spent the entire 15-minute period getting to know "George Lopez" would not be adapting appropriately since all of the time would be spent "reading" and none in "flexing." In the case of the classroom studies in Table 1 (Joyce, Weil, & Wald, 1973), the effectiveness of the adaptation in relation to an objective is more difficult to evaluate. Talking at a lower level of abstraction to younger students seems intuitively reasonable, but if the teacher's language level continued to be concrete for a long period of time (cf. Haller, 1967), then what was initially adaptive behavior might become of questionable value, since it might be more accurately described as "talking down" to the students.

Making the distinction between appropriate adaptation and spoon-feeding is not easy, and in the present system we approach it by distinguishing between immediate goals and long-term, developmental goals. As described in the next section, developmental goals are more likely to involve higher-order process skills, such as acquiring a particular mode of learning, e.g., learning how to learn, searching more effectively for information. The actual statement of goals requires, in B-P-E terms, the teacher's capacity to distinguish among various behaviors ($B_1/B_2/B_3$) and to state them explicitly.

When objectives have been stated explicitly, the adequacy of the adaptation can be empirically evaluated by measuring the degree to which the particular person-environment combination accomplished the stated objective. For example, in the Rathbone study the teacher's task was to instruct the students on the topic of pollution; ideally, it should have been possible to measure the effects of intuitive matching (greater interdependence with high CL students) to determine whether such

adaptation did in fact facilitate learning. For that, a learning outcome measure is needed.

Step 2: Obtain Information about the Student (P)

This step is closely interrelated to the next step of "classifying P," and they may often proceed simultaneously. In a situation requiring communication with another person who is completely unknown, the information-seeking phase usually proceeds through an implicit hierarchy of questions such as: (1) sensory capacity (Can he hear, speak, see?), (2) linguistic capacity (Can he understand and speak English? Does he speak only another language?), (3) age, (4) sex, and (5) general level of verbal ability. For most teachers, only the last characteristic, verbal ability, is important, since the others either are not relevant or are well known.

The teacher needs specific information about the student that can be related to the particular approach or strategy he will use. Such student characteristics have been called "accessibility characteristics' (Hunt, 1971), because they describe students' differential susceptibility to different teaching approaches. One is obviously aware of such "accessibility" in the case of sensory incapacity, such as deafness or blindness, or linguistic incapacity. Less apparent are variations among students in their susceptibility to other variations in instructional approaches.

Let us consider the four general "accessibility characteristics" proposed by Hunt (1971) and the environmental dimensions associated with each one:

Student accessibility characteristics	Relevant environmental dimension for adaptation
Cognitive orientation	Structure of presentation
Motivational orientation	Form of feedback and reward
Value orientation	Value context of presentation
Sensory orientation	Modality of presentation

Before considering the specific nature of these person-environment combinations, one should note the general nature of an accessibility characteristic: each is by definition explicitly coordinated with a

variation in the environment to which it is likely to be most susceptible. Considered in relation to "reading" the student, accessibility characteristics tell you where to look. Put another way, one reads those characteristics to which flexing is possible. A major failure of psychologists' attempts to help teachers "read" students has been their proposing a large number of student characteristics that are irrelevant because they cannot be translated into a decision which a teacher can implement. Stated positively, information about students should be sought in relation to functional characteristics, i.e., those which are related to variations in the teaching environment.

A student who is visually oriented is obviously more likely to learn when material is presented in a visual mode. A student whose Conceptual Level is low may learn most effectively in highly structured situations (the relationship between cognitive orientation and desired degree of structure is discussed in the next section). A student who is high in need for group acceptance will learn more effectively when given feeling-oriented feedback (French, 1958).

Viewing students in terms of accessibility characteristics helps to define what sort of information is needed. There are probably characteristics other than the four mentioned, but additions should meet the criterion of being functionally related to variations in the teaching environment.

In addition to the general characteristics and accessibility characteristics, task-specific information about the student is required: How does he understand the purpose of the interaction? What is his understanding of the task or the idea to be communicated? What is his interest, if any, about the topic? All of these and other specific aspects of the student in relation to the topic are familiar to teachers; yet despite the common-sense quality of the questions, teachers and other communicators do not always take seriously the need to read the student by these specific characteristics. Tiberius (1974) has made the interesting suggestion that at times the best approach to gathering information about the student may be to ask the student himself what information he thinks the teacher should know about him.

Step 3: Classify the Students (P)

Once the information has been gathered about a student, the next step is to use it as the basis for drawing inferences about the specific student on the specific characteristic, e.g., how much does he require structure, how much does he require teacher support, etc. In implicit adaptation this classification step often occurs simultaneously with obtaining information, but the distinction is useful, especially for training purposes.

This process of classification on the basis of certain information is implicitly similar to what happens in impression formation, and implicitly similar to clinical diagnosis and assessment. It requires that the teacher not necessarily accept each piece of student behavior at face value as a valid indicator of a corresponding characteristic. Rather, the teacher must view each observation as information which is to be woven into an inferentially produced understanding of the student expressed in terms of a specific characteristic. The teacher must learn that some information must be weighted differently than other information in the inferential process. Classifying students according to information also requires that the teacher consider the contextual nature of behavior, or the environment in which the observation was made. Both of these skills are relatively difficult to acquire, but they are essential to reading and classifying students accurately.

At the completion of this step the teacher would ideally have a profile of the student on the four (and perhaps other) accessibility characteristics: low in cognitive complexity, high in need for social approval, etc. Translation will be considered by taking one characteristic at a time, even though information may be available for more than one characteristic.

Step 4: Translate Student Characteristic into Teaching Approach (P to E)

At this point what has been read about the student is translated into the most appropriate adaptation. The most effective means of such translation is to use a coordinating principle or matching principle, such as "students low in Conceptual Level require more structure." Most

experienced teachers probably operate on the basis of implicit matching principles, as Torrance observed:

> I suppose alert teachers have always been intuitively aware of the fact that when they change their method of teaching that certain children who had appeared to be slow learners or even non-learners became outstanding achievers and some of their former star learners became slow learners [Torrance, 1965, p. 253].

The translation of a student characteristic into the most appropriate teaching approach may occur simultaneously with the following step of actually providing that E for the student. However, for purposes of making the implicit explicit, the translation step is distinguished since it deals with the specific nature of the relation between student characteristic and teaching approach expressed in terms of some coordinating principle. Such translation is therefore a specification of meeting student needs, since at the conclusion of this step a prescription is available for what a student needs, e.g., a highly structured approach, interpersonally supporting environment, etc.

Step 5: Provide an Appropriate Environment (E)

This step requires that the general prescription in Step 4 be specifically provided in the form of a particular teaching approach. What is needed at this step is specific examples of teaching approaches that exemplify the general prescription. For example, Joyce and Weil (1972, p. 305) have classified sixteen models of teaching in terms of their degree of structure; this classification might serve as a general guide for implementing the Conceptual Level matching model, which prescribes a general degree of structure for a particular student (Hunt, Joyce, Greenwood, Noy, & Weil, 1974). The teacher needs to be capable of differentiating various teaching environments ($E_x/E_y/E_z$), preferably in relation to a relevant dimension. Joyce and Weil have also classified models of teaching in terms of "families," i.e., information processing models, social interaction models, personal sources models, and behavior modification models, which provide guides to specifying appropriate approaches exemplifying the general environmental prescriptions in Step 4. Our understanding of variation in educational environments

and how to describe such variation is presently at a level comparable to what was understood about variations in persons at about 1900; therefore, this step will prove difficult, but systems such as those provided in Models of Teaching (Joyce & Weil, 1972) will help.

This step also requires the teacher's actual capacity to provide the specifically prescribed environment; this capacity has been described in another section of the monograph and elsewhere (Hunt, 1971, pp. 57-63). Whether teachers are likely to be more sensitive in reading characteristics to which they can flex and less sensitive to those which they cannot is an important question.

Step 6: Repeat the Cycle

Adaptation is an ongoing process that must be continually monitored. It requires continual openness to reading changes in the student (which does not necessarily mean simply continual change in teacher behavior). A major source of resistance to an analytic account of the adaptation process which requires an explicit classification of the student is the fear that such a classification may lead to stereotyping and inequitable treatment (Hunt, 1973). If adaptation is viewed as a static, one-shot classification that serves to place the student into an inflexibly prescribed environment, then of course such a procedure would be detrimental, and it might even be argued, worse than no adaptation at all.

As described in the next section, the Conceptual Level matching principle is not an enduring solution, but simply an initial guide to meeting the needs of students. Once it is applied, it must be continually monitored. Two of the most critical characteristics of educational programs based on matching principles are the way they take account of students' developmental change within the program and the arrangements that govern the adaptation to such change. Like the teacher, a program must be responsive to developmental changes in the student; otherwise it may abort the very goal it is intended to accomplish.

Responsibility for Each Step

The steps have been initially stated as if a teacher were responsible for each one, yet it is clear that each step can be carried out by other personnel, such as a consultant or a clinician. Tiberius

(1974) has proposed that teaching-learning situations be classified in terms of the degree to which the teacher has the opportunity to learn about the student in an informal way during the interchange, as opposed to receiving formal information about him from outside sources. The Balance-of-Power Task illustrates a situation in which the teacher received some information at Step 2, but was also required to gather some information about P on his own. Information provided to a teacher by an expert may produce very different effects from information which he gleans himself. The well-known teacher-expectancy studies (Rosenthal & Jacobson, 1968) illustrate a pattern in which Step 2 and Step 3 information is provided. In this regard, it is interesting to note that when the Siegel-Harkins design (1963) described in Table 1 was varied so that the "teachers" were told which type of student they were working with, these labels had no effect; the teachers continued to respond to student pull rather than labels (Siegel, 1963). This is not the place to describe the effects of provided vs. inferred student information, but the source of information is likely to make a difference, and the difference will be due to the congruence or dissonance between the explicitly provided information and the teacher's implicit interpretation.

This last observation is a special case of some of the general factors that influence teachers' implementation of a matching model: (1) the objective validity of the model, (2) its comprehensibility, (3) the skill of the teacher or other personnel in the six steps, and (4) the compatability between the objective matching principle and the teacher's implicit theory of matching. These issues are considered in more detail below.

A Conceptual Level Matching Model: An Explicit Example

Making the decisions at each step requires coordination, and therefore a model is needed which will guide the decision making. Such a model should (1) provide a basis for specifying objectives, (2) describe the information to look for, (3) describe explicitly the dimension or categories on which students are classified, (4) state the matching principle which coordinates student characteristics and the educational

approach, and (5) describe specific examples of generally prescribed educational approaches (see Hunt, 1971, Ch. 1, and Hunt & Sullivan, 1974, Ch. 5, for a more detailed description of the metatheoretical requirements for a matching model). The Conceptual Level (CL) matching model (Hunt, 1971) will be described as an example of such a coordinating theory.

Description of the Model

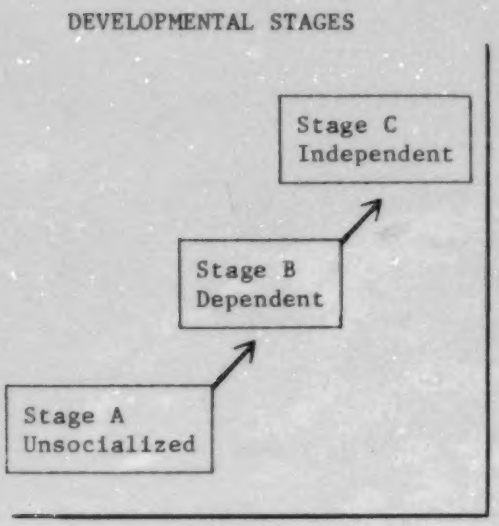
Derived from a theory of personality development (Harvey, Hunt, & Schroder, 1961), the CL matching model (Hunt, 1971) describes students in terms of their stage of development and in terms of their present learning style so that appropriate environments can be specified for both immediate and long-range purposes. Suppose, for example, that a student is at a dependent, conforming stage (which implies a contemporaneous orientation); in this case a teacher might take account of his contemporaneous orientation to plan the immediate educational environment likely to be most effective, while also bearing in mind that long-term efforts should be directed to the goal of eventually increasing the student's responsibility.

Developmental CL Model. Conceptual development is viewed on a scale of conceptual complexity or interpersonal maturity. Although development is continuous, under ideal conditions, it can best be described in stages or segments, much as a motion picture sequence could be represented by a series of still shots.

The sequence of stages in Figure 1 is telegraphically summarized as proceeding from an immature, unsocialized stage (A) to a dependent, conforming stage (B) to an independent, self-reliant stage (C). From a developmental view, the stages can be described in terms of increasing interpersonal maturity, increasing understanding of oneself and others, and increasing capacity for processing information. For example, the Stage B person differs from the Stage C person not only in being more dependent, but also in being less conceptually complex.

Progression from Stage A to Stage B requires the conceptual work of defining the external boundaries and learning the generalized standards. This general standard incorporated in Stage B then serves as the

basis for the self-defining work in progressing to Stage C. Self-definition occurs through a process of breaking away from the standard developed in Stage B. Such self-definition at Stage C then enables the individual to understand others in a more empathic fashion.



CONCEPTUAL LEVEL	STAGE CHARACTERISTICS
High	Stage C: inquiring, self-assertive, questioning, has more alternatives available.
	Stage B: concerned with rules, dependent on authority, categorical thinking.
Low	Stage A: concrete, impulsive, has poor tolerance for frustration.

Fig. 1. Development of Conceptual Level.

Matched environments for development, that is, environments likely to produce stage-specific development as shown in Figure 1, were derived by simply asking the question, "Given the conceptual work required to progress from one stage to the next, what is the environment most likely to facilitate such work?" These are summarized in Table 2.

Table 2 describes the general degree of structure required as well as the specific nature of support required to encourage development. The stage-specific matched environments in Table 2 should not be interpreted too literally because such conceptual development is a process that takes years. A teacher cannot simply provide the desired environment one day and observe developmental growth the next. Table 2 is not intended to be a blueprint for committing what Piaget has called the "American fallacy": attempting to force growth prematurely. It is intended to indicate those long-term environmental influences likely to encourage development, and to put the short-term matching prescription into developmental perspective.

TABLE 2

Matched Environments for Stage-Specific Development

Desired Development	Matched Environment
A→B	Highly structured, clear, consistent, accepting but firm.
B→C	Moderately structured, encourages self-expression.
Articulation of C	Less structured, with emphasis on empathic reaction to others.

Contemporaneous CL Model. Short-term adaptation to students is usually intended to accomplish a specific learning outcome, and thus must take account of the student's present needs or accessibility characteristics. Thus, a student's CL can provide the basis for matching teaching approach to learning orientation for immediate goals. Given the characteristics of low CL persons (dependent on external standards and incapable of generating their own concepts), they should profit more from a structured approach. Given the characteristics of high CL persons (capable of generating new concepts and holding internal standards), they should either profit more from low structure or be unaffected by variations in structure. The basic CL matching principle, therefore, is: "Low CL learners profit more from high structure and high CL learners profit more from low structure, or in some cases, are less affected by variation in structure" (Hunt, 1971, p. 44).

Stated in this form the principle seems obvious and is certainly not new. Good teachers have probably always known that students differ in how they learn: some by listening to the teacher, some by discussing, and some by working on their own. Therefore, in educational practice, the term learning style is used to describe the student's CL, and is defined in terms of how much structure a student requires in order to learn best (note that learning style here refers to how much he requires, not necessarily how much he prefers). These relations are summarized in Table 3.

TABLE 3

Environments Matched to Learning Style

Developmental Stage	Conceptual Level	Matched Environment	Learning Style
C	High	Either low or high depending on preference	Need less structure
B	Low	Moderately high structure	Need some structure
A	Very low	High structure	Need much structure

The matched environment for high CL students is left to their preference because it is assumed that they are capable of learning in a variety of structures. The practical advantage of describing students in terms of learning style as shown in Table 3 rather than in terms of CL is that the description is more comprehensible to teachers, and more directly translatable into a decision about what approach to use. Conceptual Level is a much broader term than learning style in that it includes information-processing capacity and some of the basis for a st[illegible]nt's need for structure.

Before describing the specific steps in applying the CL matching model, a clarifying comment on Table 2 and Table 3 is in order. That the matched developmental environments are slightly different from the matched contemporaneous environments should not be considered a contradiction. Table 3 gives the immediate version, but in any long-term matching program, learning style shifts from being the student accessibility characteristic to being the objective. The long-term goal of the CL developmental model is to extend the student's repertory of learning styles so that he can learn in a variety of ways. Thus, a student's capacity to learn in a wide variety of models of teaching is the educational operational definition for high Conceptual Level.

Step-by-Step Application of the CL Matching Model

Stated in B-P-E terms, the sequence of six steps is a systematic shifting of focus from one to another of the three components: B (Step 1), P (Steps 2 and 3), E (Steps 4 and 5), and a return to B (Step 6). Although each step is important, this paper emphasizes the classification of students by learning style (P), with some attention to E. Although matching can be applied at a variety of levels (within classrooms, homogeneous classroom groupings, and alternative schools varying in structure), I and my colleagues have primarily used a situation in which a group of teachers is responsible for a group of students in order to arrange optimal allocation of educational resources; four teachers in a team responsible for 150 ninth grade students is the example used below.

Step 1: Specify B. The behavioral goal can be a short-term, immediate change in observable behavior--i.e., learning--or long-term changes that are more enduring and might be considered changes in P. Thus, Step 1 involves specifying how much the adaptation is to be concerned with developmental or contemporaneous matching. The major reason for this explicit step in the CL model is to view both kinds of matching in terms of their implications for a continual reconsideration of the student by repeating the cycle. In one case (Hunt, Greenwood, Brill, & Deineka, 1972) the team of teachers was explicitly concerned with helping students to develop feelings of adequacy and to become more responsible. They saw the CL matching model, therefore, as an explication of the positions of different students on a continuum (see Figure 1).

Steps 2 and 3: Classifying P. Steps 2 and 3 are combined because in this case the basis on which students are to be classified is given by the model: variation in CL, or learning style. How shall we classify these 150 students by CL? The major method for measuring CL has been the Paragraph Completion Method (Hunt, Greenwood, Noy, & Watson, 1973), which is a semi-projective method requiring a trained coder. By coding each of a student's six paragraph responses and aggregating these six scores, an overall CL score ranging from 0.5 to 3.0 is obtained. In almost all of our matching programs, learning style information has been provided by the staff at the Ontario Institute for Studies in Education by means of

a questionnaire. Teachers can learn to assess CL by this questionnaire, but it is time consuming, and we have found it only occasionally feasible to train them to use it. These questionnaire results serve as an initial basis for providing a better understanding of the variation in student learning style by school and grade. Following is a table showing the relation between learning style, CL, and score on the learning style questionnaire.

Learning style	Need much structure	Need some structure	Need less structure	Need little structure
Conceptual Level	Very low	Moderately low	Moderately high	High
Questionnaire score	0.5-1.0	1:2-1.4	1.5-1.9	2.0 and above

Table 4 uses this format to display norms for learning style by grade and school for Grades 6, 8, 9, and 10 in six schools. Table 4 deserves close inspection because it illustrates the nature of intra-age and inter-age variation in learning style. It indicates a general tendency for CL to increase with age, but also illustrates the considerable variation within an age (grade) group as well as variation in distribution between schools for students at the same grade. If Table 4 does nothing else, it illustrates the complexity of learning style distribution, and the necessity to describe learning style in its variation (much, some, less, and little) rather than in the average, which has little meaning except as a very general indication of CL increase as a function of age.

Now we turn to the heart of the matter: Can teachers classify students by learning style on the basis of their observation? It is impossible to provide a satisfactory answer to the question of how well teachers-in-general can classify students on learning style, because the classification depends so much on the individual teacher's way of thinking. Some teachers can immediately grasp the idea and classify students according to learning style. Others find it almost impossible to think of students in any terms other than ability. Teachers suffer from

TABLE 4

Norms for Learning Style by Grade and School

Grade	N	School	Year	Mean CL	Percent of students requiring differing degrees of structure: Much (.5-1.0)	Some (1.2-1.4)	Less (1.5-1.9)	Little (2.0 +)
6	71	A	1971	1.24	41%	36%	20%	3%
6	73	A	1972	1.17	54	31	14	1
6	252	B	1972	1.32	28	37	30	5
8	133	C	1971	1.37	28	31	32	9
8	93	C	1971	1.55	11	25	46	17
8	234	D	1970	1.62	8	22	43	27
8	265	E	1972	1.28	40	26	25	9
8	161	F	1972	1.39	29	24	34	13
8	329	E	1973	1.27	34	39	25	2
8	140	F	1973	1.40	18	37	39	6
9	94	C	1972	1.51	18	28	38	16
9	133	C	1972	1.49	15	31	38	16
9	182	D	1971	1.53	16	31	27	26
10	136	D	1972	1.82	5	14	25	56

hardening of the categories like everyone else, so the ease with which a teacher can learn to classify students according to learning style depends not only on his present system of classifying students, but also on how open his implicit system of classification is to revision. It is an individual matter. Some teachers are preoccupied with the noise level and how much students contribute to it; some teachers confuse dependable students with those who are independent; some teachers hold sex stereotypes, etc.

In the terms used above, teachers must become sensitized and learn to read students according to their learning style, in addition to other characteristics which they now read. The issue, therefore, is not whether teachers in general can classify students by learning style, but, given the initial variation in teachers' ability to do so, how can they be taught to make such classifications? Training teachers to make learning style classifications has all the problems associated with devising any training program (see Hunt, 1971, Ch. 5),

so we will describe only three possible procedures which may help teachers learn the skill we are concerned with: (1) studying variation in degree of structure in the learning environment, (2) studying the behavioral characteristics of students with different learning styles, and (3) classifying their own students and comparing these classifications with those of other teachers or with the questionnaire results.

(1) What is meant by degree of structure? Since classification according to learning style involves placing a student on a continuum, it follows that teachers need to understand something about the definition of degree of structure. That is, how are low and high structured environments defined? Although degree of structure will be discussed in Steps 4 and 5, it needs to be defined here because understanding this dimension in terms of its environmental features is part of becoming sensitized to learning style. The most important part of the definition of degree of structure is the degree of teacher/student responsibility, but variation in specificity of instructions and degree or preorganization of material are also important. Highly structured environments are (a) teacher-centered, (b) involve preorganized material, and (c) involve very specific instructions and expectations. Approaches which are low in structure are (a) more likely to be determined by the student, (b) involve general instructions, and (c) involve material which is not preorganized. (See Table 7 for examples from models of teaching.) An understanding of the specific nature of approaches that are high or low in structure opens the possibility for the teacher to systematically vary the structure of his approach to all of his students for a short time to observe how well they learned and how they felt. For example, he might use a very structured, highly organized approach for the second week, taking care to note student reactions to each of the two approaches. Experienced teachers have been doing this informally for years, so the suggestion is simply to be as systematic as possible both in providing distinctively high and low structured approaches and in observing student reactions to these approaches. Teachers will need to view such systematic variation as explicitly diagnostic, because, from a pedagogical view, some students will necessarily be temporarily mismatched.

Learning about how specific approaches vary in their degree of structure will also facilitate later steps in adaptation as well.

(2) What are the behavioral characteristics of students with different learning styles? The students in the original example of 150 were later classified into four groups on the basis of the learning style questionnaire. The groups were labeled A, B, C, and D in decreasing order of need for structure, but these letters were, of course, not identical to the letters in Figure 1 which refer to "pure" groups. Each of the four teachers--Math, English, Social Science, and Science--met with each of the four groups. The pedagogical effectiveness of homogeneous learning style grouping is very complex and has been discussed elsewhere (e.g., Hunt, Greenwood, Brill, & Deineka, 1972), but one statement about learning style grouping can be made without qualification; it provides an excellent basis for sensitizing teachers to variation in learning style. Since the groups were equated in ability, they differed only in learning style. Therefore, when a teacher attempted to teach the same material in the same way to the A group and to the D group, he experienced indelibly what learning style means. Not only did he experience directly the differential appropriateness of different methods or procedures (see Table 6), but he was also confronted by all varieties of a specific learning style: girls, boys, quiet, loud, bright, not-so-bright, active, passive, etc. The one similarity was their learning style. Not only was this experience helpful to these teachers, but their reports of the characteristics of the groups and what worked best with each group are excellent training materials for teachers who have not experienced learning style groups. Table 5 summarizes the characteristics of three of the classroom groups as seen by these teachers.

These characteristics give a good description of learning style differences in the classroom, so that teachers can learn about them as efficiently as possible. However, it does not seem desirable to put them into specific behavior rating scales because scales are so susceptible to evaluative biasing factors, especially the halo effect due to student ability. Therefore, the characteristics in Table 5 should be considered guides to be used along with other information such as

TABLE 5

Initial Characteristics of Classroom Groups

Group	Characteristics
Classroom A (Very low CL)	"Short attention span." "Like to be active; there is constant movement." "A lot of physical and verbal fights." "Do not know how to function in group situations or discussion." "Incapable of thinking through a problem; will guess and let it go at that." "Try the rules often." "Work only because the teacher says to, and look to peers for approval."
Classroom B (Low CL)	"Oriented to the role of a 'good student,' one who got the right answers, had neat work and good work habits." "Seek teacher approval." "Want to work alone at their own desks." "Incapable of adjusting to a different teacher." "Upset by visitors or alterations of the schedule." "Do not express personal opinions." "Are confused by choices." "Want to be told and have the teacher constantly present."
Classroom D (High CL)	"Like to discuss and argue." "Everybody wants to talk at once and nobody listens." "Will question and volunteer additional information." "Want to solve things themselves." "Go off on sidetracks." "Don't require teacher rewards." "Are imaginative." "Are not afraid of making mistakes." "Are enthusiastic and eager to go off on things on their own." "See alternatives." "Are averse to detail and cannot tolerate going step-by-step." "May be initially self-centered and less concerned about others."

Source: Hunt, Greenwood, Brill, & Deineka, 1972, p. 26.

awareness of differing degree of structure, construct validity of CL (Hunt, 1971, Ch. 3), etc. It is tempting to systematize the classification process into a simple behavior rating scale, but as indicated in the initial discussion, this must remain an inferential process that uses behavior-in-context as the referent for classification and does not view behavior as having a necessary one-to-one relation to the classification type.

(3) How does the teacher's classification of his students compare with others' classifications? Using what he has learned from how students react to systematic variations in degree of structure and the behavioral characteristics of learning style groups, the teacher can attempt to classify his own students. Ideally, he would rely on the observation of his students under systematically varying degrees of structure, but if this is not possible, he can base the classification on recollections about his students. In either case, the primary value in this exercise will come from his comparing his classifications with other teachers' classifications of the same students or with the results of the same students' learning style questionnaire. Sharing impressions and comparing impressions with questionnaire results can be very effective since teachers are dealing with students whom they know. If their classification is at odds with that of another teacher or with the questionnaire, the disparity can lead to direct probing of misunderstanding and misconceptions.

Teachers usually ask initially: Is learning style the same in all subjects? What is the relation of learning style to ability, and are they the same? Is learning style the same as students' preference? Does learning style change? One can provide nontechnical summaries to answer these questions, but the best way to answer them is through teachers' direct experience.

This section has emphasized the teacher and the questionnaire as sources of information for assessing student learning style, but the student himself and his parents are also possible sources. The accuracy with which a student and his or her parents can assess the student's learning style is affected by many issues already described under teacher's classification, as well as others. These issues cannot be pursued here, but some attention should be given to the accuracy of student self-assessment, especially because of the increasing number of programs which rely on self-matching (Fantini, 1973, pp. 74-78).

Step 4: Translate P into E. The CL matching principle through which student learning style is translated into an appropriate degree of structure is intuitively reasonable, but it is also based on

empirical evidence. In experiments designed to test the principle, low and high CL students were identified and then assigned to one of several empirical conditions designed to vary in terms of their degree of structure, in order to investigate the pattern of differential effects. As predicted, when compared with high CL students, low CL students learned better with the high structure of a lecture than in a discovery mode (McLachlan & Hunt, 1973) or through the high structure of the rule-example sequence rather than the example-rule sequence (Tomlinson & Hunt, 1971).

The implicit, intuitive rationale for matching is described in the following statement, which was used as the basic explanation for homogeneous learning style grouping given to students and their parents.

> Students differ in how they learn, or in their learning styles. For example, some learn better by listening to the teacher, some by discussions, and others by working on their own. To say that students differ in their learning styles does not mean that a student needs only one approach (exclusively), but that, generally speaking, he has one way of learning which for him is better than others.
>
> Similarly, teachers use a variety of approaches, or teaching methods. For example, they may lecture, they may discuss, or they may let the student discover for himself. That is not to say that lecture, discussion, and independent study are the only methods, but they illustrate the variety in ways of teaching. No teacher uses one method exclusively, but he tries to use the method most likely to work with a specific class.
>
> Grouping students by learning style enables the teacher to use that teaching method most likely to work for the majority of students in that class. To say that the teacher will try to match the teaching methods to the class learning style does not mean that only one approach is used. For example, a teacher working with a class whose predominant learning style is for independent learning will not always assign them to work on their own. The teacher will use a variety of approaches with each class, and will ask students in each class to give their opinions and ideas about teaching methods throughout the year. Therefore, the learning style of the class is only to give the teacher some general idea about what teaching method is likely to work best.
>
> Regardless of the class learning style, all classes will learn the same material. It is the way they learn which will differ, not what or how much they learn. Grouping by learning style is simply a procedure to make it more likely that the teacher can meet the needs of the students.

The frequent use of homogeneous grouping by learning style as an example of adaptation should not be interpreted to mean that it is necessarily the arrangement of choice in implementing matching principles. The same points in the above statement could apply to implementation within a heterogeneous classroom, but the adaptation process would be less explicit. It is because the matching process is clear and easier to communicate in homogeneous grouping, not because it is the arrangement of choice, that it is referred to so often.

Step 4 is one which most teachers are likely to greet with apathy since it does not tell them specifically what is needed. However, after teachers experience the specific value of such a coordinating principle, they are likely to become much more interested in other principles which coordinate accessibility characteristics with variation in educational approaches.

Step 5: Provide the Appropriate E. Once the general prescription is known, e.g., highly structured approach, how does the teacher translate it into specific classroom practice? Three examples will be useful: two inductive, from the experiences of the teachers in homogeneous classroom groups; one deductive, from Joyce and Weil's Models of Teaching (1972).

Table 6 summarizes the teachers' descriptions of those methods which worked best with each of three classroom groups, and thus represents an inductive set of examples of how to define degree of structure in classroom practice. Table 6 is the matched environmental counterpart to Table 5.

Learning style groups can also be considered in terms of student pull and implicit matching. In an early exploratory study on homogeneous grouping by learning style conducted in 1963 (Hunt, 1971, pp. 26-32), results heretofore unreported were also available on student pull effects. In this study, three teachers--Science, Social Science, and English--worked with three Grade 9 groups, classified as A, B, and C, in decreasing order of need for structure, for six weeks. This study differs from the more recent homogeneous grouping studies in that both the teachers and the observers (who recorded the comments in Table 7) were unaware of the

TABLE 6

Methods and Procedures for Different Groups

Group	Methods and Procedures
A (Very low CL)	"Specific step-by-step instructions." "Make goals and deadlines short and definite." "Give immediate feedback on each step." "Praise often." "Use pictures and things they can see and touch." "Assign definite seats." "Get them to work immediately and change pace often." "Because of inability to discuss, do more seat work."
B (Low CL)	"Have them initially in rows and gradually get them working in pairs, then in small groups." "Use creative drama to encourage spontaneity, self-awareness and cooperation." "Provide non-threatening situations where they have to risk an opinion." "Provide a lot of praise and success oriented situations."
D (High CL)	"Don't require definite seating plan." "Give them many topics from which to choose." "Set weekly requirements and students make up their own timetable." "Encourage them to use each other as resources." "Have to be trained to listen to instructions as they tend to go off on their own."

Source: Hunt, Greenwood, Brill, & Deineka, 1972, p. 27; based on teachers' findings.

nature of the groups. Therefore, any adaptation or change in teaching must be attributed to implicit matching by the teacher. Put another way, these results tell more about the teachers (all of whom were experienced) than about the validity of matching.

Table 7 is of particular interest because it gives some indication of teachers' differential susceptibility to student pull, or the occurrence of a match between learning style and preferred teaching style (note the indications of an implicit match between Social Science teacher and C group, and English teacher and B group).

At a deductive level, Joyce and Weil (1972) have classified 16 models of teaching in terms of their apparent degree of structure (see Table 8). Thus, if a teacher wished to establish an environment that would fulfill a prescription for a highly structured E, Table 8 might help.

TABLE 7

Observer Comments on Teacher Reactions to Each Learning-Style Group

	Groups		
	A (need much structure)	B (need some structure)	C (need less structure)
Science Teacher	"More rigidity with emphasis (teacher) on behavior - worked to keep attention and distracting noise level down." "More concrete" "Used visual aids, and demonstration technique to make his instructional points." "He was more directive."	"Did not use demonstration or visual aids to enhance his instruction but used a more abstract approach. He did not encourage self-reliant activity or discussion on the part of the class but had most of them focus on himself for any given interchange.	"Conducted his review on abstract level and used no physical teaching aids." "He allowed much more inter-student activity than he did in the other two groups."
Social Science Teacher	"Was more on the defensive and constantly asserting control."	"She was permissive with control of the group, whereas in Class A she was more defensive and in Class C more supportive."	"Only class where the teacher had the occasion to praise a student for her teaching ability."
English Teacher	"Disciplining the class and did not elaborate too much on any of the material being read." "His attitude seemed to be more defeated with the group."	"He was not as permissive with the other two groups. He apparently enjoyed the class the most and permitted much more freedom of expression."	"The speed at which the teacher progressed with this class was much greater than any other class."

TABLE 8

Classification of Models by Amount of Structure

Model	Amount of Structure
Inductive (Taba)	Moderate
Inquiry Training (Suchman)	High
Science Inquiry Model (Schwab)	Moderate
Jurisprudential Teaching (Oliver and Shaver)	High
Concept Attainment (Bruner)	Moderate
Developmental (Piaget)	Can vary from low to high (usually high)
Advance Organizer (Ausubel)	High
Group Investigation (Thelen)	Low
Social Inquiry (Massialas and Cox)	Moderate
Laboratory Method (National Training Laboratory)	The T-group is exceedingly low structure while the exercises can be moderately structured
Non-Directive Teaching (Rogers)	Low
Classroom Meeting (Glaser)	Moderate
Synectics (Gordon)	Moderate
Awareness Training (Shutz)	Moderate to low
Conceptual Systems (Hunt)	Varies from low to high
Operant Conditioning (Skinner)	High

Source: Joyce & Weil, 1972, p. 305.

Step 6: Repeat the Cycle. The frequency with which a teacher repeats the cycle in learning style matching just described is likely to be determined by time available, length of instructional mode, and of course, the teacher. Perhaps it is enough to suggest that teachers should remain as open and sensitive to learning style cues, or student changes in learning style, as possible. We commented earlier on the importance of how an instructional program can be made to accommodate developmental change. In the case of the more recent homogeneous grouping work, the teachers informally adapt within the classroom; they are less concerned with a student's being "mismatched" since they adapt to such disparity within the classroom. Indeed, teachers who participated in the homogeneous grouping work seemed to become more generally sensitized to student characteristics other than learning style, e.g., sensory orientation, which was an unanticipated positive side-effect. One might fear that teachers working with homogeneous learning style groups might become more insensitive and more monolithic in approach, adapting only to differences between classes, because the classification had already been made for them. However, the opposite appears to be true. Perhaps because learning style grouping relieves some of the pressure to classify students, the teachers seem to make finer distinctions among the learning styles of students within a class and also more distinctions within other characteristics. Apparently, once the CL matching principle, with its specific implication, is grasped, it fosters sensitization to other accessibility characteristics.

The CL matching model has been described as a prototype for facilitating teachers' adaptation to students. There are, of course, other student accessibility characteristics which can serve to select the most appropriate environment. For example, a recent study by Chan (in progress) produced evidence that a student's need for affiliation was related to his performance and preference in learning through group discussion: students high in need for affiliation generated more hypotheses in group discussions and preferred it more when compared with an individual learning situation. Piagetian stages may serve a similar role (Hunt & Sullivan, 1974, Ch. 6), as may field dependence (Witkin, 1973). In

any case, the accessibility characteristic is likely to be more valuable to specific classroom adaptation if it is described in a form similar to that of the CL matching model.

Assessment and Training of Teachers' Adaptation Skills

Once the implicit has been made explicit through the six-step sequence, the next problem is to reverse the order: to use the explicit system for analyzing adaptation so as to improve teachers' implicit matching. One typical reaction to such an attempt to apply an analytic system to an intuitive, implicit process is to argue that the spontaneity in the implicit process will be destroyed. This argument confuses the training phase with the desired end-product. During adaptation training, teachers may be asked to become self-consciously aware of their perceptions and reactions in order to help them become more sensitive and capable of adapting to students. If their adaptation skills are improved, they should become rewoven into their spontaneous implicit matching so that their post-training teaching behavior is more adaptive, but no less spontaneous.

Any training effort must begin with an assessment of the teacher's present skills which have been described earlier in B-P-E terms, e.g., $B_1/B_2/B_3$. Although other skills are required in the B-P-E sequence, the most important are (1) skill in classification of P ("reading") and (2) skill in translating knowledge about P into appropriate E ("flexing").

Skill in Classifying Students

Ways of assessing a teacher's skill in discriminating among students is discussed elsewhere (Hunt, 1971, pp. 55-56). They vary primarily according to whether one is assessing a teacher's general ways of thinking about students or the degree to which the teacher is sensitive to, and can classify on the basis of, a pre-determined characteristic such as learning style. If one is assessing how a teacher tends to conceptualize his students, the best way to proceed would be to use some variation of the Role Concept Repertory Test (Kelly, 1955), in which the students are the stimuli to be grouped, and the teacher is asked to place his students into groups as he thinks about them. Thelen (1967, pp. 65-68) has used a

similar procedure for assessing the student types that teachers perceive. Whatever method is used, one should attempt to assess the content, structure, and malleability of the teacher's personal constructs.

Teachers' perceptions of students are a special case of drawing inferences about others. Thus, it will be important to understand what "inferential set" (Jones & Thibaut, 1958) is operating. Perceivers may focus on one of the three inferential sets: situation matching, value maintenance, or causal genetic. Situation matching is heavily evaluative, focusing on whether the person is doing the right thing; value maintenance focuses on whether the perceived person's relation to the perceiver is positive or negative; and causal genetic orientation is more concerned with why the person is behaving as he is. Teachers find it easiest to think in terms of situation-matching, which is expressed in evaluative terms of academic achievement or acceptable behavior. They often need training in using the other inferential methods.

Schroder, Karlins, & Phares (1973) presented the most comprehensive example of variations in the levels of complexity with which teachers view students. Using a specific example, they illustrate six different levels of complexity for viewing the same student: (1) categorical (only in terms of his grades), (2) unidimensional (in terms of his grades), (3) two-dimensional, unintegrated (grades and mechanical interest), (4) uniconceptual, based on two dimensions (low grades and high mechanical interest used to generate a new dimension, "unchallenged"), (5) uniconceptual, based on three dimensions ("unchallenged" dimension generated from low grades, high mechanical interest, and high social interest), and (6) multiconceptual (two new concepts, "unchallenged" and high social interest, both of which are generated from various combinations of three dimensions). The authors described how these different conceptions held by teachers were likely to be related to the use of different approaches.

Although it is unlikely that many teachers (or other persons, for that matter) achieve multiconceptual thinking frequently, their examples illustrate, among other things, the heavy reliance teachers place on achievement or ability in their conception of students. As a matter of fact, it seems safe to say that ability ("slow-fast learner"), and its

coordination with ability tracking (speed or rate of presentation), has been the only student characteristic which has been coordinated with variation in educational approach. Assessing the malleability or openness of a teacher's constructs is more difficult. Asking teachers to regroup students may provide some idea of their openness to change.

Skill in Translating Knowledge into Action

The assessment of "flexing," or use of information about student characteristics as distinct from skill in classification, could be accomplished by providing teachers with information about a student and asking them to select the most appropriate approach. As indicated, most teachers are aware of the relation between student ability (on a slow to fast learner dimension) and the speed of presentation. They may view this relation between ability and speed of presentation in terms of the relation between two sets of categories: i.e., slow learners need slow presentation; fast learners need fast presentation.

Apart from this coordinating principle, which has been the only basis for matching or adaptation during the past hundred years, teachers are unlikely to be explicitly aware of any coordinating principles. Part of this limitation is because of the overwhelming reliance on ability, and part of it may result from the fact that understanding a matching principle requires an interactive way of thinking that is not familiar to teachers, or to others for that matter. To understand and use matching principles which underlie adaptation procedures a teacher must frame fundamental questions about instructional methods in differential terms: "Given this student, what is the best approach for him?," not "What approach is generally best?" (See Hunt & Sullivan, 1974, for an extensive attempt to present an interactive way of thinking.) Skill in differential thinking therefore requires that teachers be capable of thinking at Piaget's formal operational level, since coordinating principles require "if-then" modes of thought.

Two Examples of Training in Adaptation Skills

A study by Heck (1971) illustrates both training for adaptability in interpersonal communication and the applicability of the CL matching model to the training of training agents (here called trainees).

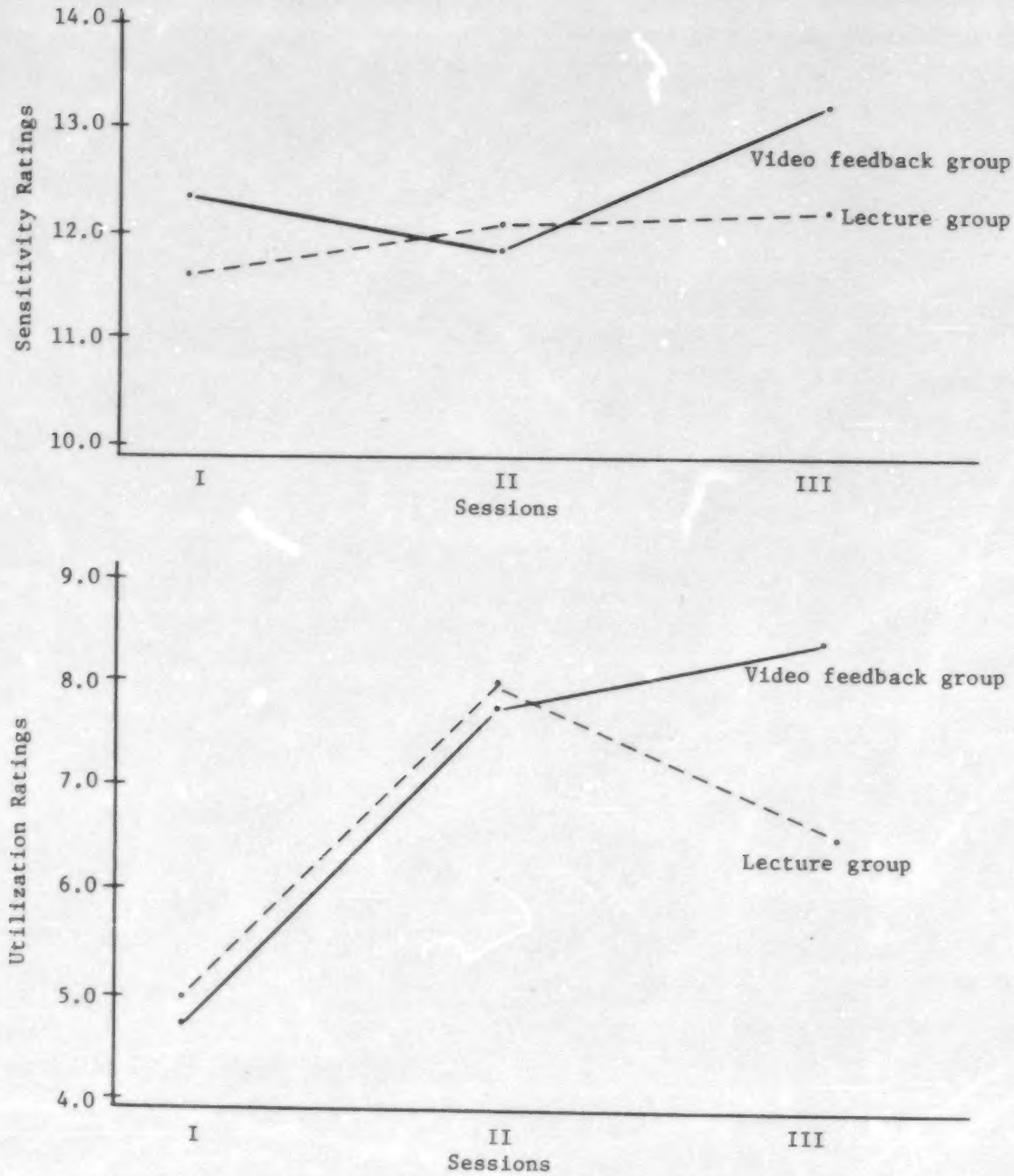


Fig. 2. Combined ratings on sensitivity and utilization factors across three communication situations for the lecture and video feedback groups. (From Schroder & Talbot, 1966.)

Pre- and post-measures were the Adaptability Index as measured by a Scarcity Task derived from the Balance-of-Power Task. Trainees were assessed on CL, and a low and high CL group were each assigned to one of two training conditions: T-group sensitivity (low in structure) and a highly structured Human Development Institute (HDI) program. As predicted, adaptability increases were greater in matched groups (High CL to T-group, low CL to HDI) than in mismatched groups (High CL to HDI, Low CL to T-group).

Schroder and Talbot (1966) used the Balance-of-Power Task as a pre-measure and two similar tasks, one as a training device and the other as a post-measure. The focus of the study was to compare video-feedback training vs. lecture training, but the study is of special interest because training effects were specifically indexed by the two factors in adaptation (which they also found in factor analysis): sensitivity ("reading") and utilization ("flexing"). Figure 2 shows the pattern of scores for the two factors. The superiority of the video-feedback training was not statistically significant, but the pattern of results is of interest, and illustrates a paradigmatic training design for the two types of skills described here.

Summary

I began by considering teachers' implicit matching, or adaptation, to students, and the variation among teachers in adaptation. The matching process was explicitly analyzed in a six-step sequence using the B-P-E (Behavior-Person-Environment) system and was illustrated by the Conceptual Level matching model. The matching process was seen in terms of a shift from specifying B, to classifying P, to translating P into an appropriate E, and then repeating the cycle, each step requiring specific teacher skills. At its most general level, matching was viewed in terms of two components: (1) sensitivity to students (ability to "read" them) and (2) modulation to the perceived classification of students ("flexing"). Specific examples for training in these two skills were offered. The long-term aim of the application of explicit matching ideas is to facilitate teachers' implicit matching in their spontaneous adaptation to the needs of their students.

References

Bell, R. Q. A reinterpretation of the direction of effects in studies of socialization. Psychological Review, 1968, 73, 81-95.

Chan, R. Learning by discussion as a function of need for affiliation. Doctoral dissertation in progress, University of Toronto.

Cronbach, L. J. How can instruction be adapted to individual differences? In R. M. Gagné (Ed.), Learning and individual differences. New York: Merrill, 1967. Pp. 23-39.

Fantini, M. D. Public schools of choice. New York: Simon & Schuster, 1973.

Flanders, N. A. Teacher influence, pupil attitudes and achievement. Final report, U. S. Office of Education, Cooperative Research Project No. 397, University of Michigan, 1962.

Flavell, J. H. The development of inferences about others. In T. Mischel (Ed.), Understanding other persons. Oxford: Blackwell, Basil, & Mott, 1974. Pp. 66-116.

Flavell, J. H., Botkin, P. T., Fry, C. L., Wright, J. W., & Jarvis, P. E. The development of role-taking and communications skills in children. New York: Wiley, 1968.

French, E. G. Effects of the interaction of motivation and feedback on task performance. In J. W. Atkinson (Ed.), Motives in fantasy, action, and society. Princeton, N. J.: Van Nostrand, 1958. Pp. 400-408.

Gage, N. L., Runkel, P. J., & Chatterjee, B. B. Changing teacher behavior through feedback from pupils: An application of equilibrium theory. In W. W. Charters, Jr., and N. L. Gage (Eds.), Readings in the social psychology of education. Boston: Allyn & Bacon, 1963. Pp. 173-181.

Haller, E. J. Pupil influence in teacher socialization: A socio-linguistic study. Sociology of Education, 1967, 60, 316-333.

Harvey, O. J., Hunt, E. E., & Schroder, H. M. Conceptual systems and personality organization. New York: Wiley, 1961.

Heck, E. J. A training and research model for investigating the effects of sensitivity training for teachers. Journal of Teacher Education, 1971, 22, 501-507.

Hunt, D. E. Adaptability in interpersonal communication among training agents. Merrill Palmer Quarterly, 1970, 16, 325-344.

Hunt, D. E. Matching models in education. Toronto: Ontario Institute for Studies in Education, 1971.

Hunt, D. E. Person-environment interaction: A challenge found wanting before it was tried. Invited address to the Division of Educational Psychology, Annual Meeting of the American Psychological Association, Montreal, 1973.

Hunt, D. E., Greenwood, J., Brill, R., & Deineka, M. From psychological theory to educational practice: Implementation of a matching model. Symposium presented at the Annual Meeting of the American Educational Research Association, Chicago, 1972.

Hunt, D. E., Greenwood, J., Noy, J., & Watson, N. Assessment of conceptual level: Paragraph completion method. Toronto: Ontario Institute for Studies in Education, 1973.

Hunt, D. E., & Joyce, B. R. Teacher trainee personality and initial teaching style. American Educational Research Journal, 1967, 4, 253-259.

Hunt, D. E., Joyce, B. R., Greenwood, J., Noy, J. E., & Weil, M. Student conceptual level and models of teaching: Theoretical and empirical coordination of two models. Paper presented at the Annual Meeting of the American Educational Research Association, Chicago, 1974.

Hunt, D. E., Joyce, B. R., & Weinstein, G. Application of communication task: An assessment of Peace Corps trainees. Report submitted to Peace Corps, Syracuse University, 1965.

Hunt, D. E., & Sullivan, E. V. Between psychology and education. Hinsdale, Illinois: Dryden, 1974.

Jones, E. E., & Thibaut, J. W. Interaction goals and bases of inference in interpersonal perception. In R. Taquiri & L. Petrullo (Eds.), Person perception and interpersonal behavior. Stanford, Ca.: Stanford University Press, 1958. Pp. 151-178.

Joyce, B. R., & Harootunian, B. The structure of teaching. Chicago: Science Research Associates, 1967.

Joyce, B. R., & Weil, M. Models of teaching. Englewood Cliffs, N. J.: Prentice-Hall, 1972.

Joyce, B. R., Weil, M., & Wald, R. The teacher innovator: Models of teaching as the core of teacher education. Interchange, 1973, 4 (2/3), 47-60.

Kelly, G. A. The psychology of personal constructs. New York: Norton, 1955.

Klein, S. S. Student influence on teacher behavior. American Educational Research Journal, 1971, 8, 403-421.

McLachlan, J. F. C., & Hunt, D. E. Differential effects of discovery learning as a function of student conceptual level. Canadian Journal of Behavioural Science, 1973, 5, 152-160.

Peterson, C. L., Danner, F. W., & Flavell, J. H. Developmental changes in children's response to three indications of communication failure. Child Development, 1972, 43, 1463-1468.

Rathbone, C. Teachers' information handling behavior when grouped with students by conceptual level. Unpublished doctoral dissertation, Syracuse University, 1970.

Rosenshine, B., & Furst, N. Research on teacher performance criteria. In B. O. Smith (Ed.), Research in teacher education. Englewood Cliffs, N. J.: Prentice-Hall, 1971. Pp. 37-72.

Rosenthal, R., & Jacobson, L. Pygmalion in the classroom. New York: Holt, Rinehart & Winston, 1968.

Schroder, H. M., Karlins, M., & Phares, J. Education for freedom. New York: Wiley, 1973.

Schroder, H. M., & Talbot, T. The effectiveness of video feedback in sensitivity training. Report submitted to Peace Corps, Princeton, N. J., 1966.

Scott, W. A. Flexibility, rigidity and adaptability: Toward clarification of concepts. In O. J. Harvey (Ed.), Experience, structure and adaptability. New York: Springer, 1966. Pp. 369-400.

Siegel, G. M. Verbal behavior of retarded children with pre-instructed adults. Journal of Speech and Hearing Disorders, Monograph supplement, 1963, 10, 47-53.

Siegel, G. M., & Harkins, J. P. Verbal behavior of adults in two conditions with institutionalized retarded children. Journal of Speech and Hearing Disorders, Monograph supplement, 1963, 10, 34-47.

Thelen, H. A. Classroom grouping for teachability. New York: Wiley, 1967.

Tiberius, R. G. Investigations into a dialogical pedagogy. Doctoral dissertation proposal, University of Toronto, 1974.

Tomlinson, P. D., & Hunt, D. E. Differential effects of rule-example order as a function of learner conceptual level. Canadian Journal of Behavioural Science, 1971, 3, 237-245.

Torrance, E. P. Different ways of learning for different kinds of students. In E. P. Torrance and R. D. Strom (Eds.), Mental health and achievement: Increasing potential in reducing school dropout. New York: Wiley, 1965. Pp. 253-262.

Turner, R. Pupil influence on teacher behavior. Classroom Interaction Newsletter, 1967, 3, 5-8.

Witkin, H. The role of cognitive style in academic performance and in teacher-student relations. Princeton, N. J.: Educational Testing Service, 1973.